[ABSTRACT]

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A vibrator for a skeleton telephone or a hearing aid is disclosed in which a vibration of an audible frequency (20 Hz - 20 KHz) generated by a piezoelectric device is transferred to auditory nerves of a user through the user's skull making direct contact with the user's skin to thereby allow the user to recognize a sound. A conventional vibrator for a conventional skeleton telephone uses a magnet like a normal speaker system, and thus the conventional skeleton telephone has limitations in reducing the size thereof due to a heavy weight and a large size of the vibrator. The disclosed vibrator includes a piezoelectric device (100) generating a physical vibration in accordance with an electrical signal corresponding to a sound; a vibration plate (110) and an electrode (120) positioned at both sides of the piezoelectric device (100) and electrically connected to the piezoelectric device (100) through a conductive line (130), respectively; a contact member (140) connected to the vibration plate (110) and making close contact with an object, so that a vibration is transferred to the object through the contact member (140); and a cover (150) supporting and covering the piezoelectric device (100). An electrical signal is applied to the piezoelectric device (100) by the vibration plate (110) and the electrode (120) in response to a sound having an audible frequency, and the piezoelectric device (100) generates a mechanical vibration in accordance with the electrical signal by a piezoelectric effect. The mechanical vibration is transferred to the object through the contact member (140).

[REPRESENTATIVE FIGURE]

FIG. 1

[SPECIFICATION]

[TITLE OF THE INVENTION]

# A SKELETON TELEPHONE USING A PIEZOELECTRIC DEVICE AND A VIBRATOR FOR A HEARING AID

[BRIEF DESCRIPTION OF THE DRAWINGS]

FIG. 1 is a cross-sectional view illustrating a vibrator according to an example embodiment of the present invention.

*REFERENCE NUMERALS OF MAJOR PARTS IN FIGURES*

| | |
|---|---|
| 100: piezoelectric device | 110: vibrating plate |
| 120: electrode | 130: conductive line |
| 140: contact member | 150: cover |

[DETAILED DESCRIPTION OF THE INVENTION]

[PURPOSE OF THE INVENTION]

[THE FIELD TO WHICH THE INVENTION PERTAINS AND THE PRIOR ART]

The present invention relates to a vibrator, and more particularly, to a vibrator for a skeleton telephone or a hearing aid in which a vibration of an audible frequency (20 Hz - 20 KHz) generated by a piezoelectric device is transferred to auditory nerves of a user through the user's skull making direct contact with the user's skin.

A conventional speaker system or a receiver, which is a conventional conversion system for converting an electrical signal to an aural signal, generates a sound wave that transfers to a user through a medium of air, and includes a large magnet, an electrical coil and a vibrating plate.

According to a telephone using the above air-transfer speaker system, a vibrating plate vibrates in accordance with an electrical signal and air vibrates in accordance with the vibration of the vibrating plate, and thus the sound wave is transferred through a medium of air. The transferred sound wave vibrates a tympanic membrane of the user's ear, and the vibration of the tympanic membrane stimulates auditory nerves of the user to thereby allow the user to recognize a sound.

When the user is in a noisy place or has a hereditary or an acquired hearing loss, the sound wave cannot be transferred to the tympanic membrane through the medium of air; thus, the hearing impaired visually communicate with others using sign language. However, the sign language cannot be transferred to others through a telephone, which allows users separated far away from each other to talk with each other.

A skeleton telephone has been suggested for overcoming the above disadvantage of the conventional telephone.

According to the skeleton telephone, a sound is transferred to a vibration of the user's skull. A vibrator vibrates in accordance with an electrical signal corresponding to the sound and is transferred to the skull of the user, and the vibration of the user's skull stimulates the auditory nerves of the user to thereby allow the user to recognize a sound. That is, the sound is transferred not through a medium of air but through a vibration of the user's skeleton in the skeleton telephone.

However, a receiver of the conventional skeleton telephone uses a magnet like a normal speaker system, and thus the conventional skeleton telephone has limitations in reducing the size thereof due to a heavy weight and a large size of the receiver.

In addition, a receiver of a hearing aid, an acoustic instrument for the hearing impaired, also includes the above magnet, so that the hearing aid also has limitations in

reducing the size thereof due to the same reasons. The conventional hearing aid is usually installed on an exterior portion of the user's ear and is protruded from the user's ear to thereby cause inconvenience to the user.

[TECHNICAL OBJECT OF THE INVENTION]

Accordingly, the present invention provides a skeleton telephone and a hearing aid including a piezoelectric device in which a vibration of an audible frequency (20 Hz - 20 KHz) is generated by a piezoelectric device in accordance with a voltage applied to the piezoelectric device using physical properties of the piezoelectric device to thereby reduce the weight and size thereof.

[CONSTRUCTION AND OPERATION OF THE INVENTION]

According to an aspect of the present invention, there is provided a vibrator for a skeleton telephone and a hearing aid. In the present invention of the vibrator, a conventional vibrating member, such as that which includes a coil and a magnet, is replaced with a piezoelectric device for generating a physical vibration in accordance with an electrical signal corresponding to a sound. As a result, a weight and a size of the skeleton telephone and the hearing aid are reduced because the piezoelectric device is much smaller than the coil and magnet, thereby improving endurance thereof.

Hereinafter, the preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

FIG. 1 is a cross-sectional view illustrating a vibrator according to an example embodiment of the present invention. The vibrator of the example embodiment of the present invention includes a piezoelectric device (100) generating a physical vibration in accordance

with an electrical signal corresponding to a sound; a vibration plate (110) and an electrode (120) positioned at both sides of the piezoelectric device (100) and electrically connected to the piezoelectric device (100) through a conductive line (130), respectively; a contact member (140) connected to the vibration plate (110) and making close contact with an object, so that a vibration is transferred to the object through the contact member (140); and a cover (150) supporting and covering the piezoelectric device (100).

The vibration plate (110) is positioned at a front surface of the piezoelectric device (100) and comprises phosphor bronze or nickel silver. The vibration plate (110) functions as an electrode. A rear surface of the piezoelectric device (100) is plated with silver, and the conductive line (130) is connected to the rear surface by soldering. The electrical signal corresponding to the sound is transferred to the rear surface of the piezoelectric device (100) through the conductive line (130).

As a result, the electrical signal corresponding to the sound is transferred to the piezoelectric device (100) through the vibrating plate (110) and the electrode (120), and the piezoelectric device (100) generates a piezoelectric vibration of an audible frequency in accordance with the electrical signal based on a piezoelectric effect.

The piezoelectric vibration is directly transferred to a user's skull to thereby cause a vibration of the skull, so that the skull functions as a medium for a signal transfer.

That is, the mechanical vibration of the vibrating plate (110) is transferred to the user's skull via the user's skin by the contact member that makes contact with the user's skin, and the vibration of the skull stimulates auditory nerves of the user to thereby allow the user to recognize the sound.

[EFFECT OF THE INVENTION]

According to the present invention, the skeleton telephone including the vibrator allows the hearing impaired with hereditary or acquired hearing loss to recognize a sound and the hearing aid including the vibrator allows a normal user to hear a sound in a noisy place. In addition, the vibrator is downsized and lightened due to the piezoelectric device, thereby reducing a size and weight of the skeleton telephone and the hearing aid, as well as improving endurance thereof.

[CLAIMS]

[Claim 1] A vibrator for a skeleton telephone and a hearing aid in which vibration signals are generated in accordance with an electrical signal corresponding to a sound, the vibrator comprising:

a piezoelectric device (100) generating a physical vibration in accordance with an electrical signal corresponding to a sound;

a vibration plate (110) and an electrode (120) positioned at both sides of the piezoelectric device (100) and electrically connected to the piezoelectric device (100) through a conductive line (130), respectively;

a contact member (140) connected to the vibration plate (110) and making close contact with an object, so that a vibration is transferred to the object through the contact member (140); and

a cover (150) supporting and covering the piezoelectric device (100).

[Claim 2] The vibrator of claim 1, wherein the vibration plate (110), which comprises phosphor bronze and functions as an electrode, is positioned at a front surface of the piezoelectric device (100) of which a front surface makes contact with the contact member, and a rear surface of the piezoelectric device (100) is plated with silver and is connected to the conductive line (130) by soldering, so that the electrical signal corresponding to the sound is transferred to the rear surface of the piezoelectric device (100) through the conductive line (130).